Rounding Decimals

Strand: Number and Number Sense

Topic: Rounding decimals to nearest whole number

Primary SOL: 4.3 The student will
b) round decimals to the nearest whole number.

Related SOL: 4.3a, c, and d; 4.6a

Materials

- Base-10 blocks (flats, rods, units) or paper models (attached)
- Covering the Wholes Decimal Grids (attached)
- Covering the Wholes Recording Sheet (attached)
- Covering the Wholes Number Lines (attached)
- Rounding Decimals to a Whole Number activity sheet (attached)
- Plastic sleeves and dry-erase markers (for use with activity sheet)
- Four 0-9 number generators, spinners, or card sets

Vocabulary

decimal, decimal point, digit, estimate, hundredth, leading zero, place value, round, tenth, thousandth, value, whole

Student/Teacher Actions: What should students be doing? What should teachers be doing?

1. Provide an opportunity for students to review the relationship among hundredths, tenths, units, and wholes by working in pairs to play Covering the Wholes. Each student will need a Covering the Wholes Recording Sheet, a 0-9 number generator, spinner, or cards, and the following base-10 models.
   - Two flats or hundredths grid models
   - 10 rods or tenths models
   - 18 units or hundredths models
   a. Instruct students that a flat represents one whole, a rod is one tenth, and a small cube is one hundredth. Each partner in a pair will use two flats as a foundation for building their wholes. On each turn, a player will roll two 0-9 number generators, record the two numbers they rolled on the recording sheet, then add the two numbers and take that many units to cover their flats, one flat at a time. Whenever a player covers 10 hundredths, he/she will replace the 10 units with one rod. (One example: player 1 rolls a 9 and a 3 for a total of 12 units. He will cover 12 hundredths (0.12) on the flat and then replace 10 of those hundredths with a rod.)
   b. For each turn, the player will write the updated amount covered on the flat on the recording sheet. The first player to cover two whole flats is the winner.
   c. As you monitor students playing and debrief with them at the end of the game, include the following in your conversation:
      - How far away are you and/or your partner from covering the whole? From covering two wholes?
      - Are you closer to having zero covered, one whole covered, or two wholes covered? How do you know?

- Are you closer to zero covered, half covered, or one whole covered?

   d. At the end of the playing time, facilitate a discussion and have student share what they learned or recalled about decimals as they played the game. Listen for responses that bring out the idea of the 10-to-1 relationship among the place values such as ten hundredths make a tenth and ten tenths make a whole. Write these statements on the board, and ask students how to write the idea with numbers. One way is to write 10 x 0.01 = 0.1 and 10 x 0.1 = 1.

2. Next, provide students an opportunity to investigate the 10-to-1 relationship using a scaled number line. Give each student a Covering the Wholes Number Line activity sheet to show how much of the whole they have covered.

   a. Each pair of students will need a 0-9 number generator, spinner, or cards. Just as in step 1, one student will roll the number generators and add the two numbers that come up. Instead of placing units and rods on a flat, players will write the sum or decimal number along the number line showing how much of the whole they have covered after each turn.

   b. Use a demonstration tool or draw the number line on the board. Model for students how to play the game and how to find the point and write the decimal on their number line. The number line has tick marks for the wholes and the tenths. Students will have to estimate where the hundredths are located. You will need to go through several rolls for students to understand how to locate their number and that rolls after the first one will require adding the new number to the last number recorded on the number line. For example, if you roll a 6 and a 7, then you need to locate 13 hundredths, or 0.13, on the number line and record the number. Through discourse allow students to help you locate 0.13. On the second roll, if you get a 4 and a 5, then the number is 0.09, so add 0.09 to 0.13 to get 0.22 and locate and label that point on the number line.

   c. As you talk with students during and after playing, include the following in your conversation with them.

- Are you closer to have zero covered, one whole covered, or two wholes covered? How do you know?
- Are you closer to have one covered, one and a half covered, or two wholes covered? How do you know?

3. Now, students will transfer their experience with representing decimals on a number line to rounding decimals to the nearest whole number using a number line.

   a. Distribute the Rounding Decimals to the Nearest Whole Number activity sheet to each student and four 0-9 number generators, and review the directions with the students.

   b. Students will work in pairs and take turns generating four digits.

   c. Each person uses the four digits but makes their own decimal number and then follows the directions in the table columns to round their number.

   d. The winner is the person who has the smallest sum of rounded numbers at the end of the game.

   e. As you talk with students during and after play this time, include the following in your conversation with them:

- How do you know what two whole numbers your number lies between?
- What number is halfway between the two whole numbers?
- Does your decimal number come before or after the number that is half way?

f. Collect the papers and review them before the next class. Select several incorrect problems from various students' papers to use in class the following day to go over misconceptions and mistakes. Return papers to the students and ask them to go back over their papers for homework and correct their mistakes.

Assessment

- **Questions**
    - If a certain decimal number rounds to the following nearest whole number (choose a whole number), what could the original decimal number have been before it was rounded? How do you know?
    - What decimal number is halfway between 5 and 6? How do you know?
    - Round the following to the nearest whole number: 0.746, 7.46, and 74.6. Explain why the answers are the same or different because the digits are the same.

- **Journal/writing prompts**
    - Sam thinks that the number 8.67 rounded to the nearest tenth is 8.6. Is Sam correct? Using the number line, explain why or why not.
    - A number rounded to the nearest hundredths place is 5.64. Make a list of at least eight possible numbers that can round to 5.64. Explain your thinking.

- **Other Assessments**
    - Write out the process for rounding decimals to the nearest whole number.
    - Use a grocery store advertisement and cut out pictures of eight different items and the cost of each. Glue or tape the items to a sheet of paper and round the cost of each to the nearest whole dollar.

Extensions and Connections (for all students)

- Present the following scenario to the class. "You are in the grocery store and need to buy bread, lunchmeat, and chips to make your lunch. You only have a $10 bill, so you are worried that you won't have enough money. Bread costs $1.82, the lunchmeat is $4.93, and the chips are $2.03. Can you tell without writing anything down whether you will have enough money to buy all three items?" After students have some time to think about the answer, have them vote yes or no. Talk about the strategies they used to *estimate* the total.

- Discuss other examples in which you would need to estimate with decimal numbers instead of finding the exact answer (e.g., calculating distances ran or driven, calculating cooking ingredients). Discuss the concept that rounding each decimal to the nearest whole number and then adding or subtracting gives a valid whole-number estimate. Also talk about using benchmarks when estimating (e.g., determining whether the number is closer to 0 or 1).

- Provide students with practice problems involving estimating sums and differences of decimals. Make sure to include decimals to tenths, hundredths, and thousandths (e.g., 3.9 + 2.446) to emphasize rounding to the closest whole number. Display a problem for about five seconds, and then remove it. Have students estimate the answer mentally and write it down. Ask selected students for their estimates, and have them explain how they made it.
- If time permits, have students write and exchange their own story problems involving estimating sums and differences of decimals.
- Include rounding and estimating with decimals during number talks.

Strategies for Differentiation

- Provide students with a visual strategy or model of how to round to the nearest whole number.
- Have students highlight or circle the number in the tenths or hundredths place to assist with rounding.
- Provide students with a cardboard frame to frame the targeted place value.
- Have students use a paint software program to create visual representations of decimals on the tenths, hundredths, and thousandths grids.
- Have students use individual place-value mats to assist with rounding activities. (Each place is coded with a different color and the students use number cards.)
- Have students work in small groups, using their individual place-value mats to solve assigned problems.
- Have students use a mathematics jingle or rap to remember how to round to the nearest whole number, tenth, or hundredth.
- Have students act out one of the visual strategies to remember how to round to the nearest whole number (e.g., rounding mountain strategy).
- Have student pairs create a model of the mountain strategy.
- Have students use decimal cards with numbers written with puffy paint, sand, glitter, etc., in different colors to highlight the targeted place values when practicing rounding.
- Have students turn their notebook paper sideways to create vertical lines for writing decimal numbers.
- Have each student create on his/her desk a visual cue for rounding whole numbers.
- Provide students with a list of steps to follow when rounding to the nearest whole number, tenth, and hundredth.
- Have students use a wall chart and/or individual mat to order the base-10 blocks.
- Have students use colored stickers, puffy paint, sequins, etc., to represent decimals on paper.
- Have students use tennis balls cut in half to represent decimals in numbers.
- Have students use colored- coded vertical lines to represent the places in numbers with decimals to assist with number placement.
- Invite the school librarian to discuss the Dewey decimal system with the class.

Note: The following pages are intended for classroom use for students as a visual aid to learning.
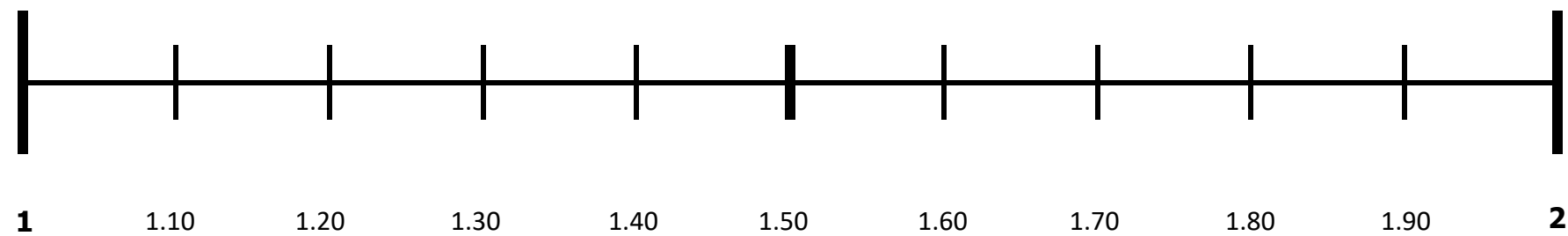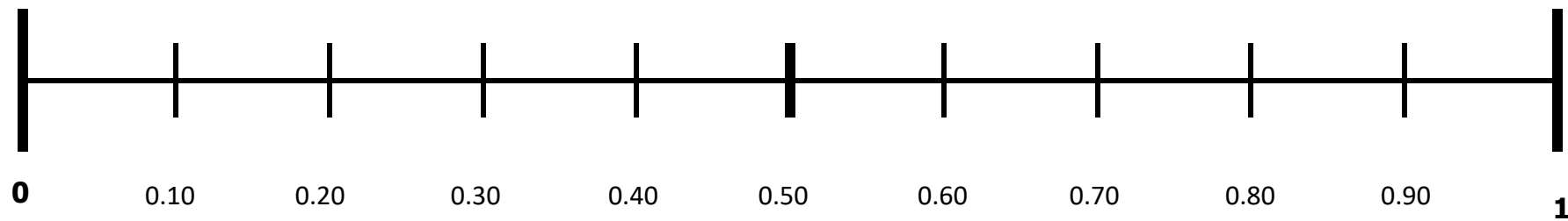
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Covering the Wholes Decimal Grids
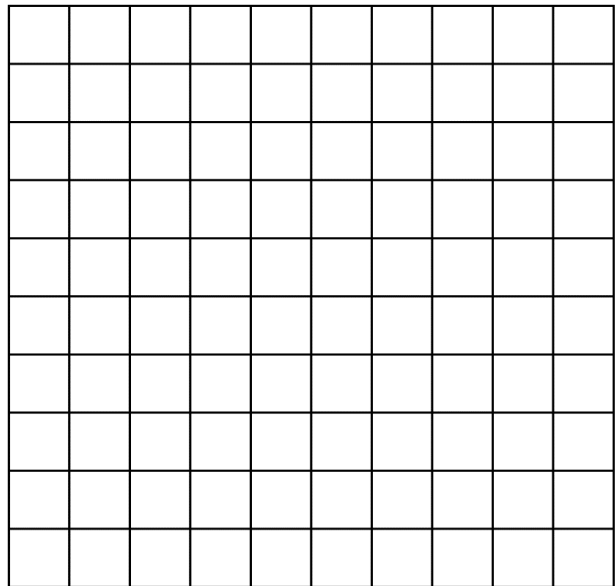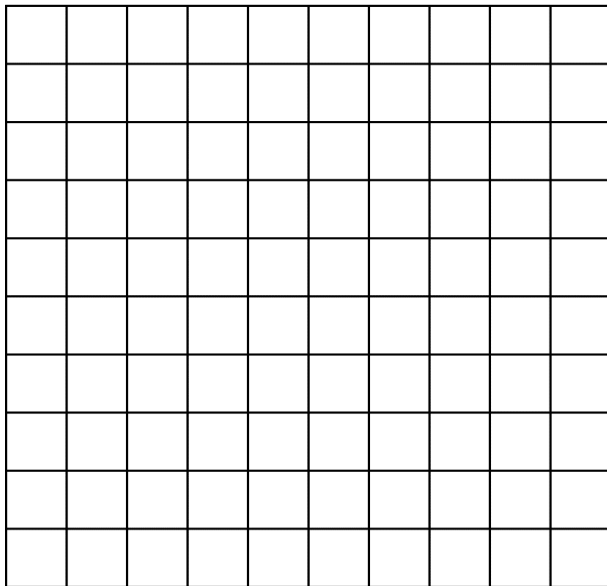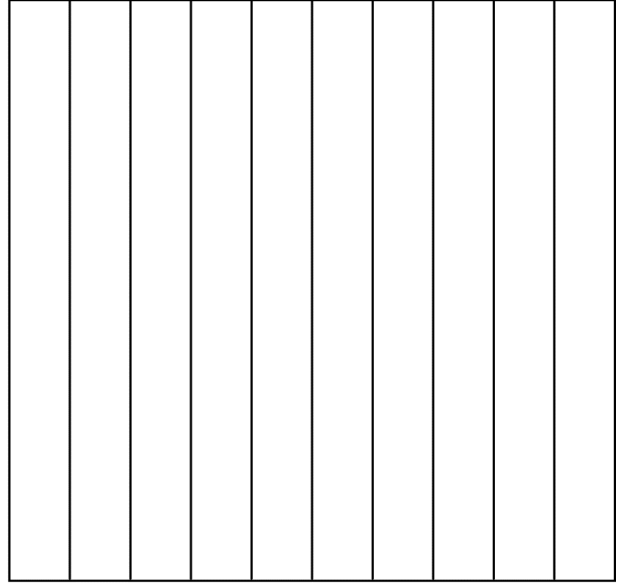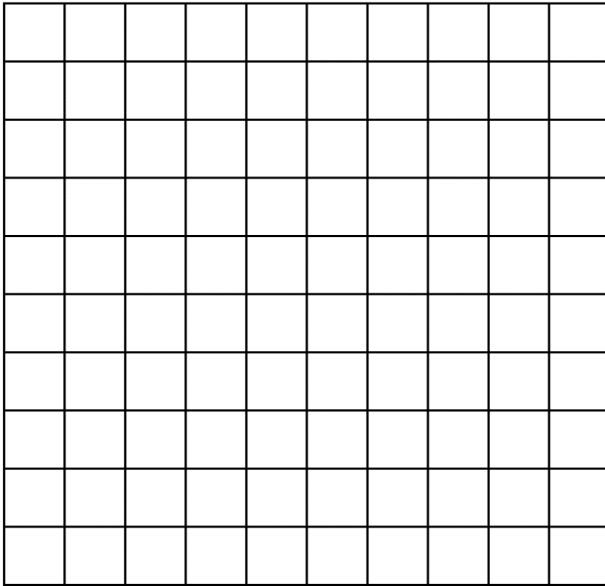
Covering the Wholes Recording Sheet

	Player 1		Player 2	
	I rolled this many units	Now I have this many hundredths covered	I rolled this many units	Now I have this many hundredths covered
Ex. 1	6 and 7	0.13		
Ex. 2	5 and 2	0.20		
1.				
4.				
5.				
6.				
7.				
8.				
9.				
10.				
11.				
12.				
13.				
14.				
15.				
16.				
17.				
18.				

Covering the Wholes Number Lines

0   0.10   0.20   0.30   0.40   0.50   0.60   0.70   0.80   0.90   1

1   1.10   1.20   1.30   1.40   1.50   1.60   1.70   1.80   1.90   2

Rounding Decimals to a Whole Number

Directions**:**
1. Roll four 0-9 number generators, and record your digits in the first column.
2. In the second column, arrange the digits to make a decimal number.
3. Use the number line below and decide what two whole numbers your decimal number lies between and record them in column 3.
4. Complete columns 4 and 5 to find the whole number the decimal number rounds to.

Digits Rolled	Make a Decimal Number	The two whole numbers the decimal number is between	Which whole number is the decimal number closest to	Your decimal number rounded to the nearest whole number is what?
	__ . __ __ __			
	__ . __ __ __			
	__ . __ __ __			
	__ __ . __ __			
	__ __ . __ __			
	__ __ __ . __			